LAB 2

Temperature and Latitude Prelab Questions

In this lab you will investigate how the average temperature varies with latitude (how far north or south a place is). Specifically, we will look at the relationship between *average maximum September temperature* in several US cities and their *latitude*.

To do this, you will each need to collect some data before you come to the lab. Each of you will need to go to the web or the library and gather the data for 5 or so cities and bring them to the lab. You will need at least 25 cities in all, and they *must* have a wide range of latitudes. This means you should meet with the people in your group a day or two before the lab, and divide up the states so that you gather data from across the country and that you don't get data from the same city twice. So each person should pick one the following regions of the country from which to get data (or more than one region if you have less than five people in a group):

- Southwest
- Northwest
- Northeast
- Southeast
- Central

In addition to the 20 or so cities that you gather, get this data for Detroit, Michigan, and Tampa, Florida.

There are definitely reference sources for this data in the library (ask the librarian). Alternatively, a useful web address is: http://www.wordclimate.com/climate/index.html

For each city, you will need to get two pieces of data:

- Average maximum temperature for September
- Latitude

In addition, you will need to know the radius of the earth in miles.

Bring *two* copies of the data you have collected to lab, with your name on at least one of them. You should (individually) hand in your data to me on the day of the lab. This will be worth 10 points toward your lab grade.

Latitude and Temperature

How much does the average temperature of a city in the northern hemisphere change per degree of latitude?

By now your group should have collected data from a wide variety of cities in the northern hemisphere. Your data set should include the average high temperature for the month of September and the latitude of various cities. Be sure to include all references and the list of cities with corresponding temperature and latitude in your final write-up.

Begin by converting each latitude to decimal notation. For example, $35^0 26'$, which is read " 35 degrees, 26 minutes " should be entered as 35 +26/60 to get 35.42^0. (Note that there a 60 minutes in a degree).

Your lab report should at least contain the following information:

- A list of your cities with their average temperature and latitude.
- A working definition of a latitude.
- The meaning of 0^0 latitude and 90^0 latitude.
- The approximate number of miles corresponding to 1 degree latitude.
- The domain that you expect the regression line to fit the data well.
- Correlation between latitude and temperature.
- A scatter plot of temperature against latitude.
- A best fit regression line. Do not include Detroit and Tampa in either the scatter plot or regression line.
- Practical interpretations of the slope and intercept.

Predict the average daily September high temperature for Detroit, Michigan ($42^0 22'$) and Tampa, Florida ($27^0 49'$).

Percent error may be calculated by subtracting the actual value from the observed value and then dividing by the actual value. Do this for Detroit and Tampa. Describe what these two values mean. What geographical reason might explain why the error was so large for Detroit?

An outlier in any graph of data is an individual observation that falls outside the overall pattern of the graph. What cities appear to be outliers in your scatter plot? Give a plausible reason why these cities wight have abnormal temperatures.

Calculate the approximate number of miles corresponding to 1-degree latitude. How many degrees north do you expect to have to travel for the average September temperature to decrease by 10 degrees?